**Cell Processes**

**The Chemistry of Life**

Compounds in living organisms are classified into two groups: **organic** and **inorganic**. Organic compounds contain the element carbon. Organic compounds make up foods and membranes in cells. Most inorganic compounds are made from elements other than carbon.

Water, an inorganic compound, makes up a large part of living matter. It is, therefore, one of the most important compounds in living things. In order for substances to be used in cells, they have to be dissolved in water. Substances and the water they are dissolved in are called **solutions**. Nutrients and waste materials are carried throughout your body in solution form.

Four groups of organic compounds make up all living things. These are carbohydrates, lipids, proteins, and nucleic acids. **Carbohydrates** are organic compounds made up of carbon, hydrogen, and oxygen. Sugars, starch, and cellulose are examples of carbohydrates. All living things release energy by breaking down these molecules. The energy is then used to power cell processes. (What organelle is involved here?)

Carbohydrates supply energy, but **lipids** are organic compounds that store and release even larger amounts of energy. You have learned that cell membranes are made up of two layers of lipids. Fats, oils, and waxes are types of lipids found in different organisms.

**Proteins**, the third group of organic compounds, are used for building cell parts. Protein molecules are scattered throughout the cell membrane. Certain proteins called enzymes speed up chemical reactions in cells without being changed or used up. In cells, some enzymes break down the food into a usable form. (What organelle does this?)

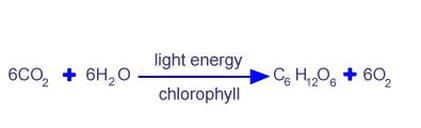
**Nucleic acids** are large organic molecules that store important information in the cell. Deoxyribonucleic acid (DNA) is found in chromosomes, mitochondria, and chloroplasts. It carries information that directs each cell’s activities. Ribonucleic acid (RNA) uses information for making proteins and enzymes.

**Energy for Life**

Think of all the energy used in a soccer game. Where do the players get all that energy? The simplest answer is, “from the food they eat”. Cells take energy stored in food as chemical energy and change it into energy that can be used in metabolism. **Metabolism** is the total of all the activities of an organism that enable it to stay alive, grow, and reproduce.

Living things can be divided into two groups based on how they obtain their food. These two groups are producers and consumers. **Producers**, such as plants, make their own food. They do this by changing light energy into chemical energy using a process called **photosynthesis**. During photosynthesis, the energy from sunlight is used to combine atoms from water and carbon dioxide to produce glucose (a type of sugar). During this process, extra oxygen molecules are left over (luckily for us!). Photosynthesis takes place inside a cell’s chloroplasts. Producers then use the glucose they make during photosynthesis for food. They store the extra glucose in fruits and roots, sometimes combining many glucose molecules together to make starch.

Here is the chemical equation for photosynthesis:



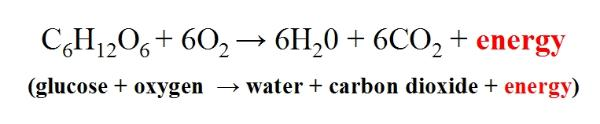
Do you eat vegetables and seeds, like red peppers, rice, and beans? Have you seen cows grazing on grass? Organisms that can’t make their own food are called **consumers**. Consumers eat producers, parts of producers, or other consumers and take in the stored chemical energy.

**Respiration**

Whether an organism is a producer or a consumer, it has to have some way to release energy from food. To do this, both producer and consumers break down food in their cells in a process called **respiration**. Inside most cells, glucose is the food that is broken down. Respiration takes place within mitochondria.

During respiration, oxygen combines with glucose to release stored energy. Carbon dioxide and water are given off as waste products of this process. Some of the energy produced in respiration is stored, and some of the energy is lost as heat. Respiration occurs in all cells of all organisms and releases the energy they need in order to stay alive.

Here is the chemical equation for respiration:



What connection do you see between the equations for photosynthesis and respiration?